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A Redescription of *Amphiprion nigripes* Regan, a Valid Species of Anemonefish (Family Pomacentridae) from the Indian Ocean

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ABSTRACT

Amphiprion nigripes Regan, usually considered a synonym of *Amphiprion perideraion* Bleeker, is shown to be a valid species of anemonefish. It is redescribed, illustrated, and compared with *A. perideraion*. Observations on the ecology and behavior of *A. nigripes* in the Maldive Islands are included.

INTRODUCTION

Amphiprion nigripes was described by C. Tate Regan in 1908 from a single specimen of 75 mm. total length collected at the Maldive Islands. In his short description he states that the species is closely allied to *A. melanopus* Bleeker and *A. perideraion* Bleeker, especially to the latter. Leonard P. Schultz revised the genus *Amphiprion* in 1953, but neglected to list *A. nigripes* as either a valid species or synonym. Woods and Schultz (Schultz et al., 1960) include it as a synonym of *A. perideraion* and under the remarks section of their paper they state: "Schultz examined the type of *A. nigripes* in the British Museum and found the pectoral fin to have

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19 rays, which number is 2 more than for western Pacific specimens of *perideraion*. Thus, *A. nigripes* may be a valid species close to *A. perideraion*." They conclude by stating that a series of specimens with distinct color patterns is needed to work out the relationship of these forms.

As a result of a collection of fishes made at Male Atoll, Maldive Islands in 1964 by the junior author (Mariscal, 1966; 1967) and additional collections from this same locale made by Loren P. Woods of Field Museum of Natural History in 1964, it has been ascertained that *A. nigripes* is indeed valid. A revision of the genus *Amphiprion* currently in progress by the senior author reveals that the closest relative of *A. nigripes* is *A. perideraion*, as Regan originally suggested. For the purposes of comparison, a table of certain counts of selected examples of *A. perideraion* (Table 1) and an illustration (fig. 1) of this species are included below.

Abbreviations used in the text are as follows: BM (British Museum); BPBM (Bernice P. Bishop Museum); CAS (California Academy of Sciences); FMNH (Field Museum of Natural History); SU (Stanford University); USNM (U. S. National Museum).

Amphiprion nigripes Regan. Figure 2.

Amphiprion nigripes Regan, 1908, Trans. Linn. Soc. London, ser. 2, Zool., 12, p. 230, pl. 24, fig. 2. (type locality: Maldives)

Amphiprion perideraion (in part) Woods and Schultz, 1960, U. S. Nat. Mus. Bull. 202, 2, p. 54.

Diagnosis.—A species of *Amphiprion* with the following combination of characters: standard length more than twice the greatest body depth; 18 or 19 pectoral rays; interorbital entirely scaled; pelvic and anal fins black; a single pale bar, 2 to 4 scales in width, behind the eye.

Description.—Dorsal rays X, 17 or 18 (usually 17); anal rays II, 13 to 15 (usually 14); pectoral rays 18 or 19; scale rows from upper edge of gill opening to base of caudal rays 55 to 68 (usually 56 to 60); from base of dorsal fin to lateral line four to five (not including dorsal base sheath scales); from lateral line to origin of anal fin 20 to 22; tubed lateral line scales 33 to 45 (usually 38 to 42); predorsal scales 20 to 25 (usually about 22); spines in opercular series 30 to 51; preopercle spines 7 to 22; suborbital spines 8 to 27; teeth conical, about 40 to 45 in each jaw of adults; total gill rakers on first arch 17 to 21 (usually 18 or 19).

FIG. 1. *Amphiprion perideraion*, 69 mm. standard length, Palau Islands. Photo by John E. Randall.

Depth of body 2.0 to 2.2; head 2.7 to 3.3; both in standard length. Snout 3.8 to 4.4; eye 3.0 to 3.8; interorbital width 3.5 to 4.2; depth of caudal peduncle 1.7 to 2.0; length of caudal peduncle 1.7 to 2.0;

FIG. 2. *Amphiprion nigripes*, 73.5 mm. standard length, South Male Atoll, Maldive Islands (FMNH 74948). Photo by John E. Randall.

length of pectoral fin 1.0 to 1.2; of pelvic fin 1.1 to 1.3; of longest (fourth or fifth) dorsal spine 2.5 to 3.0; of middle caudal rays 0.8 to 1.3; all in length of head. Angle of snout profile with lengthwise axis of body 50 to 54 degrees.

Spines of dorsal fin low, gradually increasing in height to fourth or fifth spine; then gradually decreasing; caudal fin truncate to slightly emarginate; predorsal scales extend to an imaginary line connecting the anterior edge of the orbits. The spine counts of the head are variable, generally increasing in number with age.

Color in alcohol: Head and side of body primarily brown with a slight reddish cast, grading to darker brown ventrally; breast pale brown; narrow (two to three scales wide) greyish bar behind the eye extending from mid-dorsal region to the lower margin of the subopercle; the bars of each side usually join dorsally, but there are occasional exceptions. Pelvic and anal fins black; all other fins tan and slightly reddish. The caudal peduncle usually lighter brown than the rest of the body.

Live coloration: Head and body largely orange; snout pinkish; a single white bar behind the eye; dorsal fin and pectorals red-orange; caudal fin yellow-orange; pelvics and anal fin black. There is an

excellent color photo of this species in Eibl-Eibesfeldt (1965, pl. 9), erroneously referred to as *Amphiprion melanopus*.

Comparisons.—On the basis of gross external morphology, *A. nigripes* belongs to the subgroup of *Amphiprion* containing *A. akallopisos*, *A. perideraion*, and an unnamed form from the Philippine Islands which will be described later by the senior author. All of these are slender forms whose depth is less than half the standard length. *A. akallopisos* usually has 19 soft dorsal rays compared to the usual 17 for *nigripes*. Also *akallopisos* lacks the head bar, a character which is shared by the undescribed Philippine species. In *nigripes* the head bar is always present.

A. nigripes most closely resembles *A. perideraion* on the basis of morphology and color pattern, but differs from it in several respects (see Table 1). In addition to the characters listed in Table 1, noteworthy differences can be found in the shape of the teeth and in color pattern. *A. nigripes* has conical-shaped teeth while those of *perideraion* are more or less incisiform. The pelvic and anal fins of *nigripes* are characteristically black and in *perideraion* they are pale tan.

A. melanopus, which is confined to the New Guinea region, Great Barrier Reef, and islands of the western Pacific, was considered to be a close relative of *A. nigripes* by Regan (1908) and has subsequently been confused with this species by other workers. Important differences between these two species can be found in body depth and color. The depth in the standard length for ten specimens of *A. melanopus* examined varied from 1.7–1.9, while the depth of *A. nigripes* is always in excess of 2.0. The pelvic and anal fins of these two species are usually black. However, in *nigripes* the black color is confined to these fins and the ventral portion of the body adjacent to them, while in *melanopus* the entire body is usually blackish. *A. melanopus* juveniles are usually dark colored and exhibit two to three white bars up to a size of at least 30 mm. standard length. *A. nigripes* juveniles are pale and have only one bar, just behind the eye.

TABLE 1.—A comparison of soft fin-ray counts and number of vertical scale rows of *Amphiprion nigripes* and *A. perideraion*.

	Pectoral rays				Dorsal rays			Anal rays				Vertical scale rows							
	16	17	18	19	16	17	18	12	13	14	15	<53	54	55	56	57	58	59	60
A. nigripes			10	6		13	3		1	14	1			1	1	3	4	2	2
A. perideraion	1	14	1		12	4		4	12			4	3		1			1	

Field Observations.—Field observations of the anemonefish symbiosis have been conducted by the junior author in the South Pacific at Tutuila Island, E. Samoa; Great Astrolabe Reef, Fiji Islands; Vanikoro Island, Santa Cruz Islands; Bougainville Island, Solomon Islands; New Britain Island, Territory of New Guinea; and at Green Island on the Great Barrier Reef, N. Queensland, Australia. In the Indian Ocean, field studies were conducted off the coast of Kenya, East Africa; at Mahe Island, Seychelles Islands; at Funidu and Hulele Islands, Male Atoll, Maldive Islands, and at Pipidon and Pipilek (Phi Phi Islands) off Phuket, W. Thailand. Based on these observations and collections and the literature, it is obvious that some species of *Amphiprion*, such as *A. percula* (Lacapede) and *A. xanthurus*, have a wide distribution throughout the South Pacific and Indian Oceans. Others, such as *A. akallopisos*, are common throughout the Indian Ocean while still other species appear to be more or less restricted to the Pacific. Thus, it came as a surprise to find *Amphiprion nigripes* apparently restricted to the Maldive Islands in the Indian Ocean, although another widely distributed *Amphiprion* (e.g., *A. xanthurus*) was also common here.

At Funidu Island, *A. nigripes* was the most common species of *Amphiprion* present. It was found exclusively in the Indo-Pacific host anemone *Radianthus ritteri* Kwietniewski. *A. xanthurus* (with only a single exception) was restricted to the other common giant anemone present, *Stoichactis giganteum* Forsskal. *A. nigripes* never wanders far from its anemone host and is very aggressive toward other species of fishes which enter the immediate vicinity. However, up to eight *A. nigripes*, of variable size, may be found inhabiting a a single anemone. In other cases, the *R. ritteri* anemones occurred in clusters and a number of individual *A. nigripes* freely moved between several neighboring anemones.

In the several hundred specimens of *A. nigripes* either observed or collected in the field by the junior author, the color and banding pattern was remarkably uniform. The pelvics and anal fin were black in the larger specimens. The juveniles, however, appear to lack the black fins initially.

Changes in color and pattern with growth were followed over a period of about one month in the shipboard aquarium for a single juvenile *A. nigripes*. During this time the fish nearly doubled in size (a standard length of 16.5 mm. when preserved). When this fish was first captured with the larger fish and anemone shown in Figure 3, the pelvic fins were a bright yellow-orange as were the other

FIG. 3. Underwater flash photograph of *Amphiprion nigripes* with its *Radianthus ritteri* anemone. Several *Dascyllus trimaculatus* were also inhabiting this anemone along with the *A. nigripes*. Photograph taken by Mariscal at Funidu Island, Male Atoll, Maldives on November 6, 1964.

fins. However, about two weeks after capture the pelvic fins had begun to acquire a dusky black color, as did the abdominal region. This latter phenomenon appeared to be due to the visceral peritoneum taking on a black pigmentation and seemed to be correlated with the acquisition of the black fin color. Initially, the black chromatophores of the fins were concentrated between the fin rays and then gradually spread out over the fins. In this particular case, the black color of the anal fin was acquired after that of the pelvics since no anal fin color change was observed by the time the young fish was preserved.

The narrow, white head bar also changed with growth during this period. When collected, the lateral portions of the bars did not

meet dorsally, but over a period of the next three weeks the two sides of the bars gradually grew toward each other until the juncture was complete. Apparently, this union sometimes fails as relatively large adults were both collected and observed with a noticeable gap in this bar dorsally. During the final week of observations, the darkening of the pelvic fins and the joining of the white bar were proceeding rapidly enough so that a slight daily change could be detected.

It was of interest to note that at the same time the above changes in color, pattern, and size were occurring in the small *A. nigripes*, there also seemed to be an increased awareness of the small fish by the larger *A. nigripes* in the same anemone (fig. 3). This was evidenced by the increased frequency of chasing of the smaller fish and might have been triggered by the juvenile fish's aforementioned acquisition of the adult characteristics. During this time the young fish became increasingly territorial toward the species of *Dascyllus* in the same aquarium (*D. trimaculatus* and *D. aruanus*).

Observations of the behavior of adult *A. nigripes* have been reported elsewhere (Mariscal, 1966, 1967, 1970a, in press).

Material examined (Lengths are standard length).—*A. nigripes*, 18 specimens, 28.4–78.6 mm. Maldive Islands; Indian Ocean; BM 1908.3.23.101, 1 (type), 57.4 mm.; FMNH 74948, 9, 37.2–78.6 mm.; FMNH 74548, 2, 28.4–33.4 mm.; FMNH 74547, 2, 47.0–54.0 mm.; FMNH 74950, 2, 45.9–54.0 mm.; Mariscal collection, 1, 16.5 mm. *A. perideraion*, 30 specimens, 29.5–70.8 mm. Gulf of Thailand—Three lots of uncatalogued material at the CAS, 25 specimens 29.5–70.8 mm. Palau—BPBM 6809, 4, 32.0–70.0 mm. Singapore—FMNH 74947, 1, 55.0 mm. *A. melanopus*, ten specimens, 48.6–87.5 mm. Caroline and Marianas Islands—Four lots of uncatalogued material at the CAS, four specimens, 61.0–87.5 mm. New Caledonia—USNM 197683, 1, 48.6 mm. New Guinea—SU 28651, 1, 55.4 mm. New Hebrides—USNM 197238, 1, 65.5 mm. Marshall Islands—BPBM 6380, 2, 58.0–69.5 mm. Queensland—USNM 204282, 1, 73.5 mm.

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